

# **DRAFT - 2006 Monitoring of Pesticide Drift from Applications to Control Browntail Moth**

The following is a summary of a pesticide drift study, conducted by the Maine Board of Pesticides Control (BPC) during May 2006, as required by 22 MRSA § 1445.

## **I. Goal**

These data were collected to help determine whether untreated buffer areas or other requirements are needed to prevent unreasonable pesticide drift into marine water bodies.

## **II. Background**

Written into emergency laws 22 MRSA §1444 and 22 MRSA §1445 were temporary limits on pesticide applications for control of the browntail moth in coastal areas in Cumberland, Sagadahoc and York counties. The statute also required the BPC to perform a drift monitoring project and consult with their Environmental Risk Advisory Committee (ERAC) and the Lobster Conservancy, to evaluate risks and benefits relating to pesticide applications near marine waters. A report from the Board with its findings and recommendations will be made to the joint standing committee of the Legislature having jurisdiction over agriculture, conservation and forestry matters by January 2, 2007.

## **III. Drift Study Design and Methods**

A plan for this drift study was developed April 12, 2006, by nine people representing the BPC, the University of Maine Food Chemical Safety Laboratory, and the Maine Lobstermen's Association. Also giving input to study design via email were two Department of Marine Resources employees.

### **A. Site Selection**

Pesticide applicators from each of the four participating companies chose a property bordering the ocean to be monitored by the BPC. Table 1 below describes these sites, and Table 3 in the Sample Results section displays additional site information.

| <b>TABLE 1. 2006 SAMPLING SITES</b> |                             |                             |                  |
|-------------------------------------|-----------------------------|-----------------------------|------------------|
| <b>DESCRIPTION</b>                  | <b>BPC SITE DESIGNATION</b> | <b>LATITUDE<sup>1</sup></b> | <b>LONGITUDE</b> |
| Falmouth                            | 03BPCS004                   | 43°43'49.6"                 | -70°12'24.7"     |
| Harpswell, Lookout Point            | 03BPCS005                   | 43°48'33.6"                 | -69°59'36.5"     |
| Freeport                            | 03BPCS006                   | 43°50'01.0"                 | -70°02'54.5"     |
| Yarmouth, Cousins Island            | 03BPCS007                   | 43°46'11.8"                 | -70°08'39.8"     |

<sup>1</sup> Datum = NAD83

## B. Insecticide Application and Sample Collection

Two sites were treated with cyfluthrin (Falmouth and Yarmouth) and the other two sites were treated with permethrin. BPC staff was on site at the time of the applications and recorded weather conditions using a Kestrel 3000 Pocket Weather Meter.

Prior to pesticide treatment, a BPC employee mounted 185-millimeter diameter filter papers to drift card stands at each site to catch any pesticide drift. Water sensitive cards were also used at three of four sites (see Figure 1). New cardboard platform bases were used at each site.



**Figure 1. Drift card triplicates and yellow water sensitive card**

Refer to Figures 2 through 5 below for diagrams showing the layout of drift cards in relation to the pesticide spray target areas, direction of spray, and wind direction. These four diagrams are not to scale. Small circles represent drift cards; two circles side by side are duplicates, and three circles side by side are triplicates. The sample ID (a number in the 700s) is listed next to each drift card.

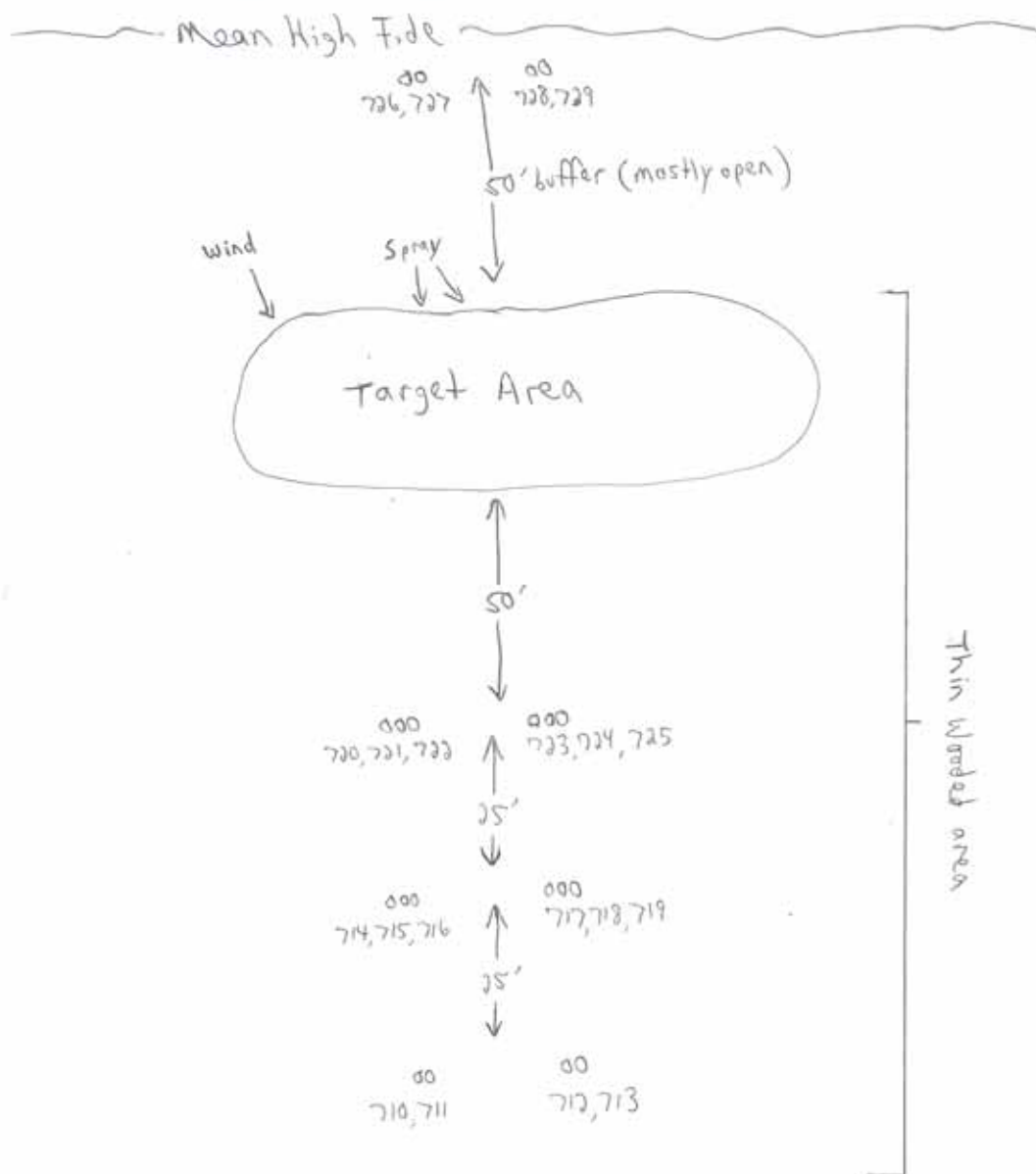
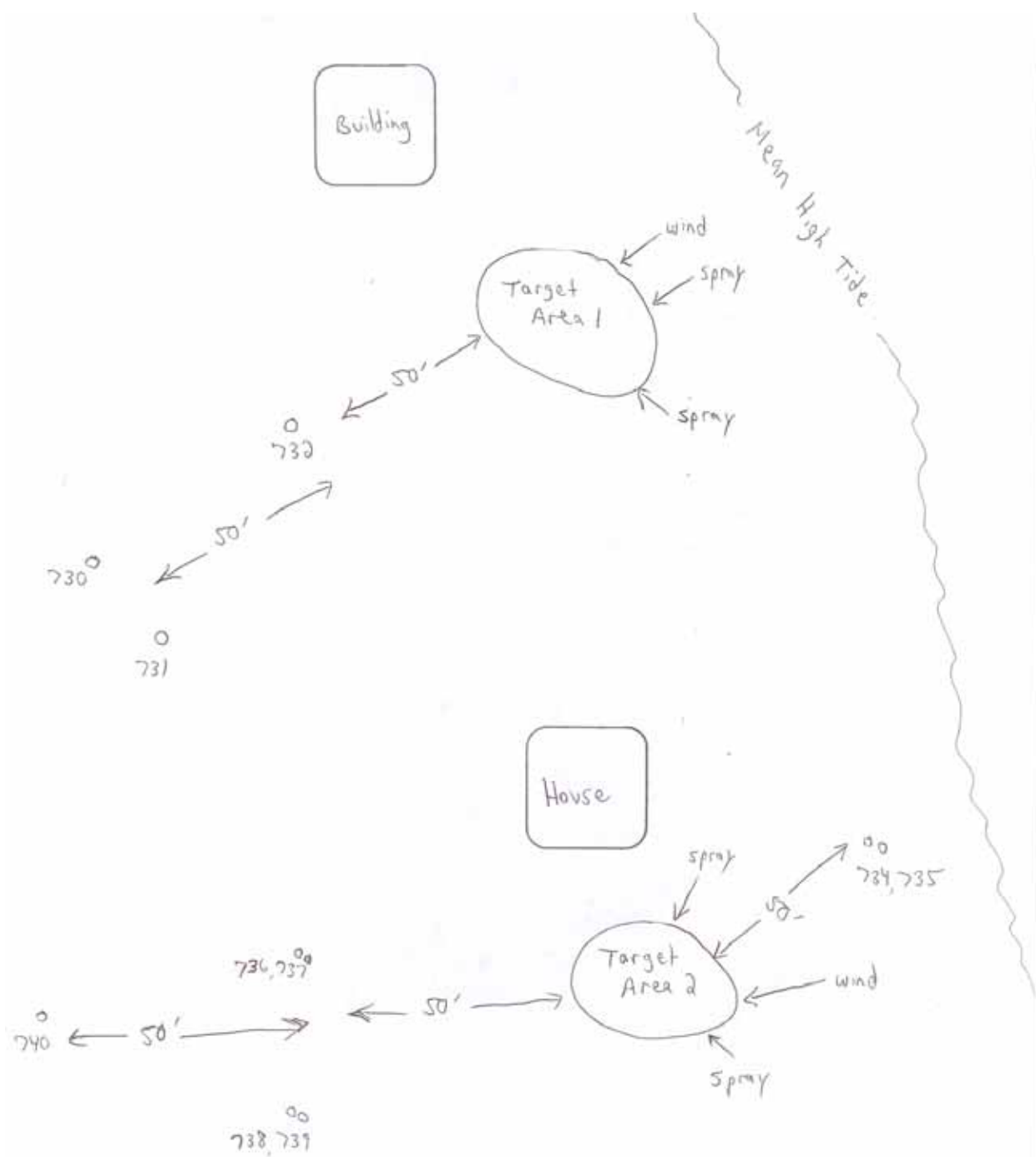


Figure 2. Falmouth Site



**Figure 3. Harpswell Site**

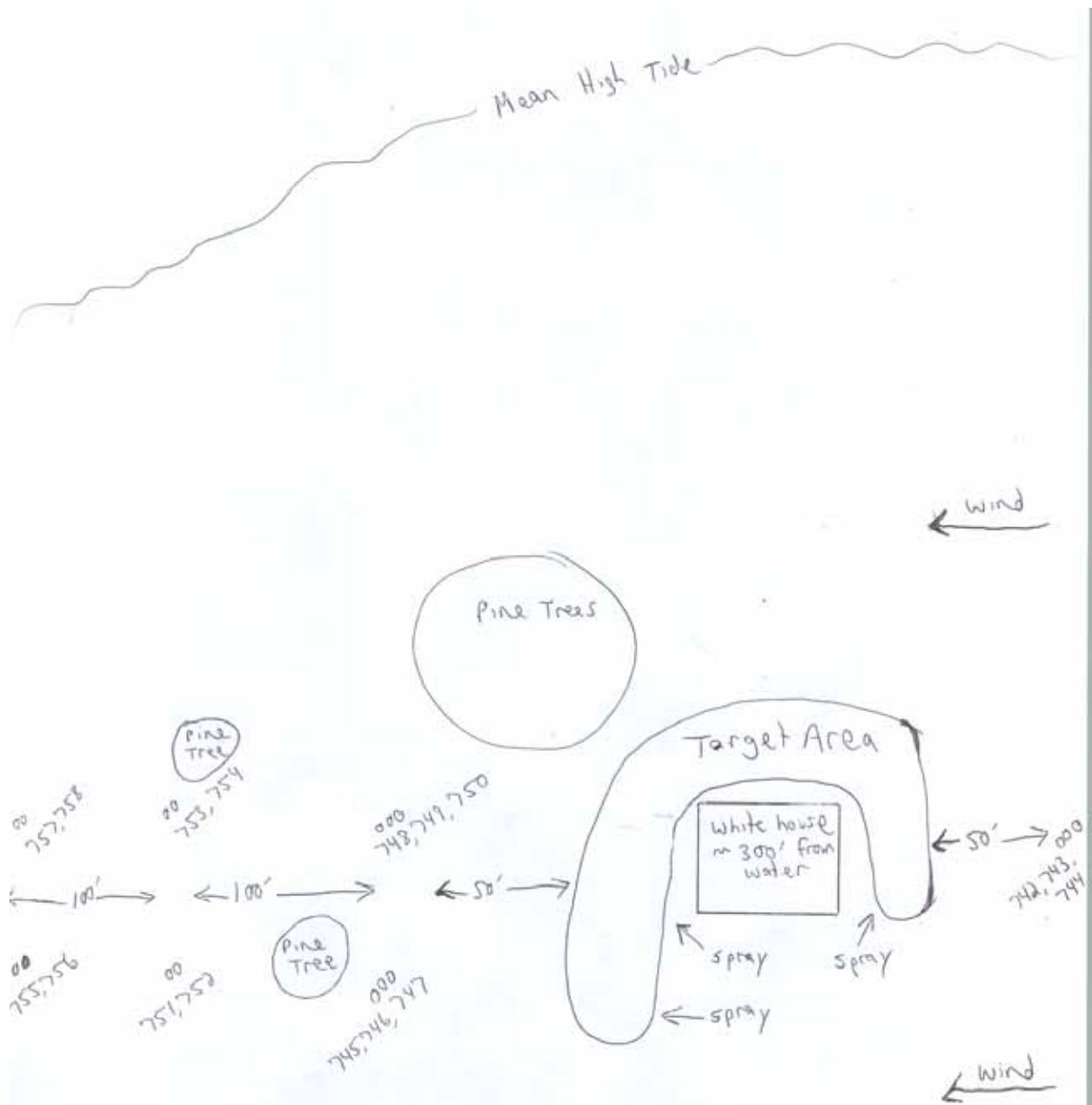


Figure 4. Freeport Site

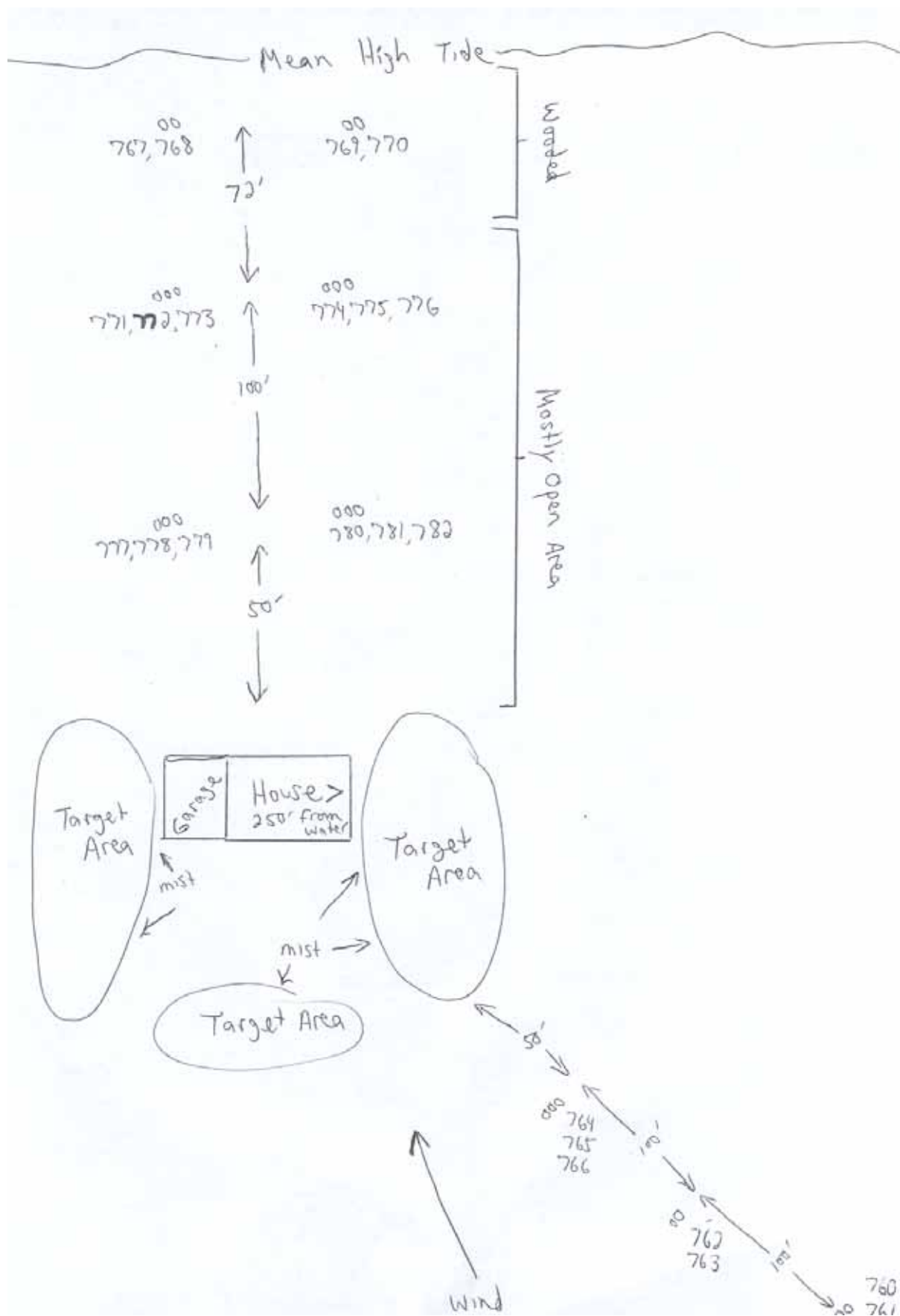


Figure 5. Yarmouth Site

Photographs were taken of each pesticide application. After each spray event all of the samples were collected in 120 ml amber glass jars (one drift card per jar) and placed immediately in iced coolers. This was done to preserve the samples by preventing exposure to sunlight and maintaining cool temperatures. A new pair of latex gloves was worn for the collection of each drift card. Samples were delivered to the University of Maine at Orono, Food Chemical Safety Laboratory within 72 hours of collection, or within one week if frozen. BPC standard operating procedures for the collection of environmental samples and chain-of-custody procedures were observed throughout the sampling program.

#### C. Analytical Methodology

The University of Maine, Food Chemical Safety Laboratory performed the sample analyses using ethyl acetate extraction and a gas chromatograph/ mass spectrometer (GC/MS). The limit of quantification (LOQ) for cyfluthrin was 125ng (0.47 ng/cm<sup>2</sup>) and LOQ for permethrin was 15ng (0.05 ng/cm<sup>2</sup>).

#### D. Quality Assurance/Quality Control (QA/QC) Procedures

The University of Maine, Food Chemical Safety Laboratory maintains a quality assurance project plan (QAPP) with QA/QC protocols for the Board of Pesticides Control and the United States Environmental Protection Agency for the analysis of samples used in the enforcement of state and federal pesticide regulations. In addition, all related BPC standard operating procedures were followed, including the collection of field blanks and sample duplicates on at least a 1 in 20 basis.

### IV. Sample Results

The drift card results from this study are displayed in Table 2 below. Sample IDs that are listed beside each other and of the same font size are duplicates or triplicates. Results for the yellow water sensitive cards matched laboratory results below. Water sensitive cards showed small blue dots representing drift, in areas where drift did occur.

| <b>Table 2. 2006 Sample Information</b> |                             |                                  |                                    |
|---|-----------------------------|----------------------------------|------------------------------------|
|   | <b>up wind or down wind</b> | <b>distance from target (ft)</b> | <b>results (ng/cm<sup>2</sup>)</b> |
| <b>Falmouth Sample IDs, May 18*</b>     |                             |                                  |                                    |
| 710                                     | down                        | 100                              | ND                                 |
| 711                                     | down                        | 100                              | ND                                 |
| 712                                     | down                        | 100                              | 0.5                                |
| 713                                     | down                        | 100                              | missing                            |
| 714                                     | down                        | 75                               | ND                                 |
| 715                                     | down                        | 75                               | ND                                 |
| 716                                     | down                        | 75                               | ND                                 |
| 717                                     | down                        | 75                               | ND                                 |

|                                       |      |     |         |
|---------------------------------------|------|-----|---------|
| 718                                   | down | 75  | ND      |
| 719                                   | down | 75  | ND      |
| 720                                   | down | 50  | ND      |
| 721                                   | down | 50  | ND      |
| 722                                   | down | 50  | ND      |
| 723                                   | down | 50  | ND      |
| 724                                   | down | 50  | 0.56    |
| 725                                   | down | 50  | ND      |
| 726                                   | up   | 50  | 0.68    |
| 727                                   | up   | 50  | ND      |
| 728                                   | up   | 50  | ND      |
| 729                                   | up   | 50  | ND      |
| <b>Harpwell 1 Sample IDs, May 23*</b> |      |     |         |
| 730                                   | down | 100 | 18.51   |
| 731                                   | down | 100 | 20.83   |
| 732                                   | down | 50  | 210.49  |
| 733 (water sensitive card only)       |      |     |         |
| <b>Harpwell 2 Sample IDs, May 23*</b> |      |     |         |
| 734                                   | up   | 50  | ND      |
| 735                                   | up   | 50  | ND      |
| 736                                   | down | 50  | 3.07    |
| 737                                   | down | 50  | 2.06    |
| 738                                   | down | 50  | 209.84  |
| 739                                   | down | 50  | 170.09  |
| 740                                   | down | 100 | 0.15    |
| 741 (water sensitive card only)       |      |     |         |
| <b>Freeport Sample IDs, May 24*</b>   |      |     |         |
| 742                                   | up   | 50  | ND      |
| 743                                   | up   | 50  | 0.09    |
| 744                                   | up   | 50  | 0.06    |
| 745                                   | down | 50  | 123.27  |
| 746                                   | down | 50  | 146.32  |
| 747                                   | down | 50  | 230.41  |
| 748                                   | down | 50  | 21.97   |
| 749                                   | down | 50  | 15.86   |
| 750                                   | down | 50  | 53.44   |
| 751                                   | down | 150 | 0.19    |
| 752                                   | down | 150 | 0.32    |
| 753                                   | down | 150 | 0.31    |
| 754                                   | down | 150 | 0.38    |
| 755                                   | down | 250 | 11.4    |
| 756                                   | down | 250 | 3.83    |
| 757                                   | down | 250 | ND      |
| 758                                   | down | 250 | ND      |
| 759 (blank)                           |      |     | missing |



| Yarmouth Sample IDs, May 26* |      |     |      |  |
|------------------------------|------|-----|------|--|
| 760                          | up   | 250 | ND   |  |
| 761                          | up   | 250 | ND   |  |
| 762                          | up   | 150 | ND   |  |
| 763                          | up   | 150 | ND   |  |
| 764                          | up   | 50  | ND   |  |
| 765                          | up   | 50  | 0.56 |  |
| 766                          | up   | 50  | ND   |  |
| 767                          | down | 222 | ND   |  |
| 768                          | down | 222 | ND   |  |
| 769                          | down | 222 | ND   |  |
| 770                          | down | 222 | ND   |  |
| 771                          | down | 150 | ND   |  |
| 772                          | down | 150 | 0.74 |  |
| 773                          | down | 150 | 0.49 |  |
| 774                          | down | 150 | 0.87 |  |
| 775                          | down | 150 | 1.02 |  |
| 776                          | down | 150 | 0.7  |  |
| 777                          | down | 50  | 3.47 |  |
| 778                          | down | 50  | 2.55 |  |
| 779                          | down | 50  | 3.24 |  |
| 780                          | down | 50  | 4.27 |  |
| 781                          | down | 50  | 4.23 |  |
| 782                          | down | 50  | 3.31 |  |
| 783 (blank)                  |      |     | ND   |  |

**Table 3. Site Information**

|   | *Falmouth, May 18               | *Harpswell 1, May 23        | *Harpswell 2, May 23        | *Freeport, May 24               | *Yarmouth, May 26        |
|---|---------------------------------|-----------------------------|-----------------------------|---------------------------------|--------------------------|
| <b>Pesticide used</b>                           | Tempo, cyfluthrin               | Astro, permethrin           | Astro, permethrin           | Astro, permethrin               | Tempo, cyfluthrin        |
| <b>EPA Reg. No.</b>                             | 432-1363                        | 279-3141                    | 279-3141                    | 279-3141                        | 432-1363                 |
| <b>Pesticide dilution rate</b>                  | 2 oz/ 100 gal                   | 6 oz./ 100 gal              | 6 oz./ 100 gal              | 5 oz./ 100 gal                  | 5 oz./ 100 gal           |
| <b>Amount of diluted pesticide used on site</b> | 8 gal                           | 25 gal                      | 10 gal                      | 50 gal                          | 15 gal                   |
| <b>Drift adjuvant added?</b>                    | Yes, Direct (polyvinyl polymer) | Yes, Lesco Spreader Sticker | Yes, Lesco Spreader Sticker | No                              | No                       |
| <b>Time of spray</b>                            | 7:18-7:21AM                     | Early AM                    | Early AM                    | 6:30                            | 5:18-5:25AM              |
| <b>Height of trees</b>                          | 40'                             | 82.5'                       | 74' (several red oaks)      | 40-55'                          | 40-50'                   |
| <b>Size of treated area</b>                     | area of three trees             | a few trees                 | a few trees                 | trees around perimeter of house | property perimeter trees |

|                                  |   |  |  |   |   |
|----------------------------------|---|--|--|---|---|
| <b>Wind speed</b>                | calm, not registering on Kestrel  | 4.9 mph ave, 7.5 max   | 4.9 mph ave, 7.5 max   | 1.7 mph ave, 4 max  | calm, not registering on Kestrel  |
| <b>Wind direction</b>            | from E, away from water   | off water  | off water  | toward water but very calm (treated area > 250' from water) | hard to tell at first but toward water (from NE)(treated trees were 250'from water)               |
| <b>Temperature</b>               | 50 F  | 47.9 F   | 47.9 F   | 50.7 F  | 51 F  |
| <b>Humidity</b>                  |   | 79%  | 79%  | 96%   | 86%   |
| <b>Cloud cover</b>               | full clouds   | light clouds, really no blue sky   | light clouds, really no blue sky   | light clouds, partly clear                                  | part clear  |
| <b>Time of weather recording</b> | 7AM   | 6:50AM   | 6:50AM   | 5:40AM  | 5:25AM  |
| <b>Application equipment</b>     | hydraulic sprayer, nozzle size 14, 500 psi, 12 gpm  | hydraulic sprayer, nozzle size 16, 400 psi, 50 gpm max   | hydraulic sprayer, nozzle size 16, 500 psi, 50 gpm max   | hydraulic sprayer, #12 disk, 800 psi, 20 gpm max            | mist blower   |
| <b>Notes</b>                     | this common area where drift cards were set up was wooded but trees had been thinned, no water sensitive cards used - too wet | some drift cards blew off stands before they could be collected (extra staples used next time). Water sensitive cards used | some drift cards blew off stands before they could be collected (extra staples used next time). Water sensitive cards used | water sensitive cards used                                  | mist blower pointed in different directions as moved around perimeter. Water sensitive cards used |

## V. Discussion and Conclusions

Temporary laws, requiring a 50' no spray buffer next to the high tide line, requiring pesticide spray to be directed away from the water, and requiring the wind to be away from the water, appear to protect marine water from drift. One up wind sample near the water (sample 726 in Falmouth) was found to have a level of pesticide near the limit of quantification, but this could have been a lab error since its duplicate was ND, or might have been a result of the calm morning.

This study found evidence of some pesticide drifting down wind after an application, as expected. Drift cards were set up from 50' down wind to no more than 250' down wind from the target area. According to these results, some pesticide can drift 250' from the target. Some samples did not show pesticide drifting that far however, and that could be due to trees outside of the target intercepting the drift before it landed on the cards, lack of wind, or other variables.

Samples 743 and 744 were found to have low levels of pesticide. These were samples "up wind" of the application but during the spray event the hydraulic sprayer was briefly turned in the direction of the up wind samples to spray part of a tree. If the wind died down during this moment, that could explain the pesticide drifting over to the up wind cards 50' away. The target area at this site was

greater than 250' from the water so the direction of spray did not have to be in a particular direction (see Figure 4).

## **Appendix. Site Photos**



**Figure 6. Nozzle used in Falmouth.**





**Figure 7.** Falmouth target area is three trees about 50' from water and drift cards were set up further away from the water (down wind), and at water's edge.



**Figure 8.** Falmouth application.





**Figure 9. Harpswell application.**



**Figure 10. Freeport target area is trees around house, all greater than 250' from water.**





**Figure 11. Freeport application.**



**Figure 12. Freeport drift cards.**





**Figure 13. More Freeport application. Sprayer pointed toward drift cards.**



**Figure 14. Freeport drift cards set up across lawn. Pine trees may have caught some drift before it reached cards.**





**Figure 15. Yarmouth drift cards set up in this area. Ocean is down this hill over 250' from target area. Slight movement of air toward the water during this spray event.**